March/April 2022

FAA Safety BRIEFING

Meet *the* Maintainers

Federal Aviation Administration

U.S. Department
of Transportation

**Federal Aviation
Administration**

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ABOUT THIS ISSUE…

The March/April 2022 issue of *FAA Safety Briefing* focuses on the aviation maintenance industry. Articles discuss the important role aviation maintenance technicians (AMTs) play in keeping our skies safe and highlight some of the programs that recognize their achievements and provide ongoing education for these unsung heroes of aviation safety.

Contact Information
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FAA Safety BRIEFING

The FAA Safety Policy Voice of Non-commercial General Aviation

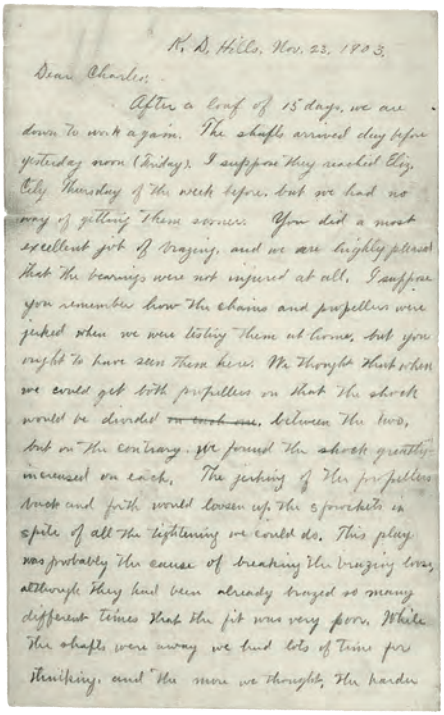
DEPARTMENTS

MASTER MECHANICS

Most pilots are familiar with the Wright Brothers Master Pilot Award, which goes to pilots with a half-century flying record and no certificate revocations. No less important is the prestigious Charles Taylor Master Mechanic Award. Named in honor of the first aviation mechanic in powered flight, the Charles Taylor Master Mechanic Award recognizes the lifetime accomplishments of senior mechanics. It is fitting that this award bears Mr. Taylor's name because he served as the Wright Brothers' mechanic.

> NAMED IN HONOR OF THE FIRST AVIATION MECHANIC IN POWERED FLIGHT, THE CHARLES TAYLOR MASTER MECHANIC AWARD RECOGNIZES THE LIFETIME ACCOMPLISHMENTS OF SENIOR MECHANICS.

The Wright Brothers hired Taylor to fix bicycles, but as Orville and Wilbur spent more time on their aeronautical pursuits, he increasingly ran the business. When it became clear that an off-the-shelf engine with the required power-to-weight ratio was not available for their first engine-driven *Flyer*, the Wrights turned to Taylor. He designed and built the aluminum-copper, water-cooled, four-cylinder aircraft engine in only six weeks, based partly on rough sketches provided by the Wrights. The Wrights needed an engine with at least eight horsepower (6.0 kW). The engine that Taylor built produced 12. The cast aluminum block and crankcase weighed 152 pounds (69 kg). He became a leading mechanic in the Wright Company after it was formed in 1909, and he worked for the Wright-Martin Company in Dayton, Ohio until 1920.



K. D. Hills. Nov. 23. 1903.

Dear Charles:

After a lay of 15 days, we are down to work again. The shafts arrived day before yesterday noon (Friday). I suppose they reached Eliz. City Thursday of the week before, but we had no way of getting them sooner. You did a most excellent job of bracing, and we are highly pleased that the bearings were not injured at all. I suppose you remember how the chains and propellers were jerked when we were testing them at times, but you ought to have seen them here. We thought that when we could get both propellers on that the shock would be divided ~~on each one~~, between the two, but on the contrary, we found the shock greatly increased on each. The jerking of the propellers broke and frith would loosen up. The sprockets in spite of all the tightening we could do. This play was probably the cause of breaking the bronzing bars, although they had been already bronzed so many different times that the fit was very poor. While the shafts were away we had lots of time for thinking, and the more we thought, the harder

A November 1903 letter from Orville Wright to Charles Taylor praising Taylor's work and updating him on the Flyer's status.

His one regret: as Taylor himself noted, "I always wanted to learn to fly, but I never did. The Wrights refused to teach me and tried to discourage the idea. They said they needed me in the shop and to service their machines, and if I learned to fly, I'd be gadding about the country and maybe become an exhibition pilot, and then they'd never see me again."

Recognizing Master Maintainers

Though he didn't gain fame as an exhibition pilot, Taylor certainly has fame in the world of maintainers. Anyone who operates an aircraft, and especially anyone who owns an aircraft, will also appreciate how his work set the stage for this critical profession.

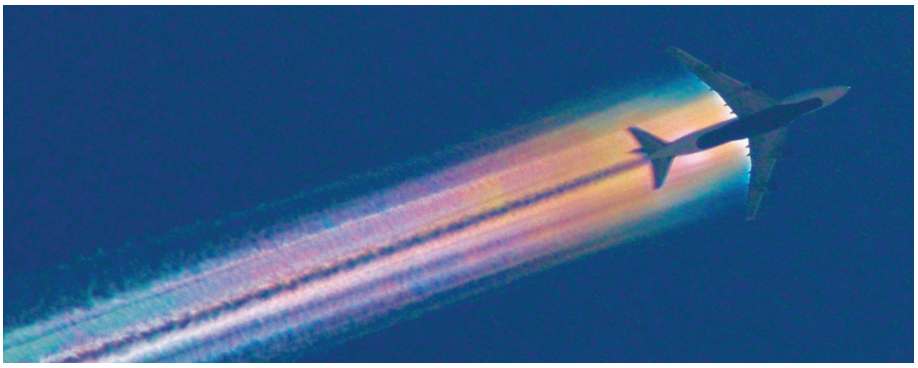
Since maintainers are the focus of this issue of *FAA Safety Briefing* magazine, it is fitting to offer a reminder of what it takes for a mechanic to earn the Charles Taylor Master Mechanic Award. To be eligible, the candidate must be a U.S. citizen who has worked consecutively or non-consecutively in an aviation maintenance career for a period of 50 years. He or she must have been an FAA-certificated mechanic or repairman working on N-registered aircraft maintained under the requirements of Title 14 Code of Federal Regulations for at least 30 of the 50 total years required. The remaining 20 years may be accepted if that individual served as an aircraft mechanic/repairman in the U.S. military, worked as an uncertificated person in a U.S. aviation maintenance facility that maintained U.S.-registered aircraft, or worked as an uncertificated person in the U.S. aircraft manufacturing industry.

Congratulations to all who have earned this award! And, if you happen to know an aviation maintenance technician (AMT) who might be eligible, please encourage him or her to check the criteria at bit.ly/CharlesTaylorAward and apply. I enjoy giving awards, and I'll be eager to see your favorite AMT on the next round.

LEARN MORE

Charles Taylor Master Mechanic Award Information
bit.ly/CharlesTaylorAward

AVIATION NEWS ROUNDUP



FAA Photo by Bryan Dahlvang.

More Efficient Descent Procedures Reduce Fuel Burn, Emissions

Descent procedures that the FAA put in place last year across the country save millions of gallons of fuel and reduce carbon dioxide (CO2) and other emissions by hundreds of thousands of tons. The 42 Optimized Profile Descents (OPDs) allow planes to glide down safely from cruising altitudes into airspace for some of the nation's largest airports instead of the fuel-consuming stair-step procedure.

For each group of descents used at an airport, the FAA estimates that an average of 2 million gallons of fuel is saved and 40 million pounds of emissions reduced annually. That is equivalent to eliminating the fuel and CO2 emissions of 1,300 Boeing 737 flights from Atlanta to Dallas.

Under traditional staircase descent procedures, aircraft repeatedly level off and power up the engines. This burns more fuel and requires air traffic controllers to issue instructions at each step. With optimized descents, aircraft descend from cruising altitude to the runway in a smooth, continuous path with the engines set at near idle.

The U.S. also released its first-ever comprehensive Aviation Climate Action Plan to achieve net-zero emissions by 2050. Earlier in 2021, the FAA announced more than $100 million in matching grants to increase aircraft efficiency, reduce noise and aircraft emissions, and develop and implement new software to reduce taxi delays. The White House also announced its Sustainable Aviation Fuel Grand Challenge, a government-wide initiative designed to catalyze the production of at least three billion gallons per year by 2030.

More information is available about the FAA and its environmental efforts at its Sustainability Gateway at faa.gov/sustainability.

FAA Awards $10M in Grants to Develop Next Generation of Pilots and AMTs

Earlier this year, the FAA awarded $10 million in grants to educate the next generation of pilots, aviation maintenance technicians (AMTs), and other aviation professionals. Five million went towards the Aircraft Pilots Aviation Workforce Development Grants, which were awarded to accredited higher-education institutions, high schools, state and local governments, and flight schools. Another $5 million went towards the Aviation Maintenance Technical Workers Workforce Development Grants, which were awarded to organizations that teach technical skills and prepare participants to pursue aviation maintenance careers.

Grantees for the pilot workforce can use the funding to create and deliver a curriculum to prepare students to become aircraft pilots, aerospace engi-

SAFETY ENHANCEMENT TOPICS

Please visit bit.ly/GAFactSheets for more information on these and other topics.

MARCH

Pilot Proficiency and WINGS —
How proficiency training programs, like WINGS, can help improve flight safety.

APRIL

Angle of Attack —
An AOA indicator can help pilots detect this otherwise invisible airfoil position and avoid a stall.

neers, or unmanned aircraft systems operators. Grantees for the AMT workforce can establish new educational programs; provide scholarships or apprenticeships for individuals pursuing employment in the aviation maintenance industry; conduct outreach about careers in the aviation maintenance industry to primary, secondary, and post-secondary school students; and support educational opportunities related to aviation maintenance in economically disadvantaged areas.

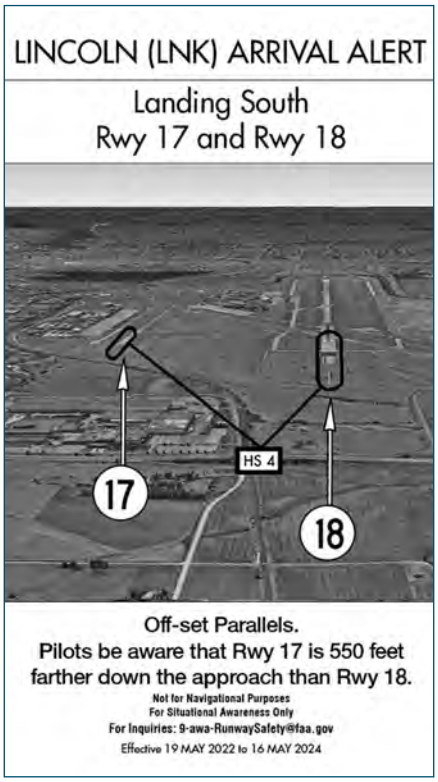
To maintain the safest and most efficient aerospace system well into the future, the FAA recognizes the need to create a robust pipeline of skilled and diverse professionals. These grants are one way the agency is working to address the projected shortages of aircraft pilots and mechanics in the industry. Go to bit.ly/FAAgrants to see the locations and individual amounts of each grant.

Hot Spot Symbology Changes Coming Soon

It's vital to know where the hot spots are before you go to any airport — even if you have been there before. Hot spot identification is essential for pilots, particularly during preflight planning and while taxiing on airport surfaces. However, hot spots are currently depicted in a variety of shapes with no particular meaning. Well, that's about to change! On May 19, hot spots on the FAA's aeronautical charts and publications will have three shapes with two distinct meanings. Circles or ellipses will depict ground movement surface safety risk areas like taxiway/runway configurations and intersections. A cylinder will be used to highlight wrong surface event risk areas such as offset parallel runways, a nemesis for general aviation pilots.

The FAA's Runway Safety Group also worked collaboratively with agency and industry stakeholders to develop a visual enhancement tool to help pilots with runway confusion at certain airport locations. These new Arrival Alert Notices offer a visual aid to pilots to enhance situational awareness when a Wrong Surface Hot Spot related to Arrivals is identified. There are 11 airports with Arrival Alert Notices which will be evaluated over a one-year test period.

Check out the National Association of Flight Instructors (NAFI) Mentor*Live*! Webinar on March 16 to learn more about standardized Hot Spot symbology and the new Arrival Alert Notice. For details on how to register and get WINGS credit, or to watch an archived version of the presentation, go to mentorlive.site/program/54.html. The FAA also would like your help in spreading the word about these important changes. Click bit.ly/airdiagrams to find airport diagrams and view the Runway Safety Hot Spots list.



Core Course for Aviation Maintenance Technicians

Ethics for Aviation Maintainers (ALC-718) is this year's core course for aviation maintenance technicians (AMTs) at FAASafety.gov and is the required course for participation in the AMT Awards Program. Based on Chapter 11 of the *FAA Human Factors Guide for Aviation Maintenance and Inspection* (bit.ly/FAAHFAMTGuide), this course explains the expectation of trust that the public places in aviation maintainers. It explores the meaning of the term "ethics" as it applies to aviation maintenance and introduces seven key principles of ethical behavior and a moral decision-making framework for making mindful decisions. Complete your free registration at FAASafety.gov to take advantage of this course and thousands of free online safety and risk reduction seminars, webinars, and courses that you can attend or view virtually.

FAA Ends Commercial Space Astronaut Wings Program

Due to the advent of the commercial space tourism era, the FAA will start recognizing individuals who reach space on its website, instead of issuing Commercial Space Astronaut Wings. Any individual who is on an FAA-licensed or permitted launch and reaches 50 statute miles above the surface of the Earth will be listed on the site.

The FAA expects the commercial human spaceflight industry to continue to grow and the number of people launching to space to increase dramatically in the coming years.

The Wings program was created by the FAA Office of Commercial Space Transportation's former Associate Administrator, the late Patti Grace Smith. Its purpose was to recognize pilots and flight crew who furthered the FAA's mission to promote the development of vehicles designed to carry humans into space. With three commercial space companies now licensed by the FAA to fly spaceflight participants, and companies conducting operations, her vision is largely fulfilled.

For a complete list of FAA Commercial Space Astronaut Wings recipients, go to bit.ly/FAAspace.

AEROSPACE MEDICAL MAINTENANCE TOOLS

The FAA's Office of Aerospace Medicine does far more than ensure safety through medical examinations. We strive to improve safety in all aspects of aviation.

For most in the aviation community, contact with the FAA's Office of Aerospace Medicine (AAM) is limited to periodic medical examinations from an Aviation Medical Examiner (AME) or even a one-time evaluation for some BasicMed users. However, the FAA's medical experts are engaged in many other activities to improve aviation safety in such areas as aircrew and AME education, cabin safety, toxicology, and human factors research. It might surprise you to learn that we are concerned with how human factors affects not only pilots but also maintainers, and we have staff dedicated to this cause.

> THE FAA'S OFFICE OF AEROSPACE MEDICINE DOES FAR MORE THAN ENSURE SAFETY THROUGH MEDICAL EXAMINATIONS. WE STRIVE TO IMPROVE SAFETY IN ALL ASPECTS OF AVIATION.

You might ask why this is important for you. Well, first of all, every one of us has a vested interest in good maintenance. AOPA's 2021 Nall Report notes that in 2019, maintenance factors contributed to over 19% of total general aviation (GA) accidents and over 8% of fatal GA accidents. Researchers estimate that the majority of GA accidents can, in part, be traced back to a failure to follow written procedures (FFP) and can occur for many reasons. These include fatigue, time pressure, miscommunications, not having the right tools or parts, technical work instructions that are not easily understood or followed, and cultural issues.

Do you pressure your maintenance shop for early completion, cut corners in a pre-flight inspection, skip steps in maintenance (e.g., the torque wrench is at home, but it feels about right), or delay maintenance because the annual is only a few months away? There are many examples in aviation where a step was omitted in a repair, a reassembly was incomplete, or a repair was completed improperly with catastrophic consequences. Our human factors team is working hard to reduce these events.

At CAMI (Civil Aerospace Medical Institute), we conduct ongoing research to identify and mitigate areas of maintenance safety risk. One strategy is to raise awareness about human factors by providing timely education. CAMI's research outputs have included the development of free training programs. Although CAMI developed this training with the aviation maintenance technician (AMT) in mind, many training courses are also directly applicable to pilots. You can find CAMI's training courses and safety and human factors resources online at faa.gov/pilots/training/airman_education. CAMI also publishes the *Aviation Mx Human Factors Quarterly* newsletter (bit.ly/HFMxQuarterly).

The FAASTeam has many safety-related topics and courses for AMTs as well. *The Buck Stops with Me* (course ALC-534), for example, is specifically designed to promote a culture of procedure following. If you'd like to take a deeper dive into the world of maintenance human factors, take a look at the *Operator's Manual: Human Factors in Aviation Maintenance*: bit.ly/HFMxManual (PDF).

Fusing it All Together

AAM collaborates with manufacturers and airlines to explore the use of emerging technologies, like augmented reality devices (think real-world information and virtual reality combined). These innovations would make it possible for AMTs to access work instructions (sometimes animated), pertinent updates, and safety-critical information, as well as track task completion without referring to a tablet or written procedures.

Pilots, imagine how your preflights might improve if the checklist item appeared right in front of you just as you're examining that same area on your aircraft, perhaps even with a visual cue of what you should see. Just think what an improvement to safety and task efficiency such a feature may bring.

Dr. Susan Northrup received a bachelor's degree in chemistry and a medical degree from The Ohio State University, as well as a master's degree in public health from the University of Texas. She is double board-certified by the American Board of Preventive Medicine in Aerospace Medicine and Occupational Medicine. She is a retired U.S. Air Force colonel and a former regional medical director for Delta Air Lines. She is also an active private pilot.

DR. LEO HATTRUP, FAA MEDICAL OFFICER

FIGHTING FATIGUE

Over the years, I have talked to numerous pilots who have flown past a fix, missed calls from ATC, or felt startled to wake up after being asleep for seconds to minutes. A colleague relayed an experience as a military co-pilot. He was on a low-level patrol mission with four other crew members. "I woke up and sheepishly looked around only to discover that I was the only one awake." I personally have had the opportunity to nudge my safety pilot awake while shooting practice approaches with high terrain on both sides.

While fatigue often leads to just minor errors, it can also be catastrophic. The National Transportation Safety Board (NTSB) has cited fatigue as a causal or possibly contributory factor in multiple mishaps. Prominent examples include American International Airways Flight 808 on August 18, 1993, ValuJet 592 on May 11, 1996, and FedEx Flight 1478 on July 26, 2002. In each accident, the aircraft was destroyed. Everyone on the ValuJet flight perished. The NTSB believed that fatigue contributed to these accidents, affecting aircrew or maintainers.

Fatigue is a broad, subjective term that can refer to both mental and physical impairment often perceived as a lack of "energy." We focus here on mental fatigue associated with cognitive and performance impairment. Pilots are at risk for poor concentration and easy distraction, task saturation, decreased alertness and attention, slowed reaction time, poor judgment and memory, and emotional lability. The latter manifests itself by impulsivity, irritability, aggressiveness, and anger. In the long term, mental fatigue can lead to depression, insomnia, apathy, and isolation.

Inadequate sleep frequently causes fatigue. It can stem from simply pushing oneself too hard, circadian rhythm disruptions from shift work or trans-meridian travel, stress (at work or home), recreational/extracurricular activity, or ongoing sleep disturbances such as being the parent of a young or ill child. However, fatigue can also be both an initial manifestation of medical problems and a persistent symptom if not adequately treated. Infections, including influenza and COVID-19, can present with fatigue, as can many medications. Chronic illnesses such as endocrine disorders (including hypothyroidism and diabetes), anemia, depression, substance abuse, cancer, infection (hepatitis/HIV/tuberculosis), and sleep apnea can all initially present as fatigue.

We are poor judges of our own fatigue level. Like hypoxia, the condition impairs our ability to recognize its presence. We should trust the input from others and from our own warning symptoms. If you don't know them, a spouse, family member, or close friend probably does.

Pilots, in general, tend to be motivated to overcome challenges despite difficulty. The solution is to take a break and rest. Ask this question: "If I am too busy to stop, do I have time to do it over?" Sometimes there is no do-over option.

> **TO AVOID FATIGUE, GET ADEQUATE SLEEP AND EXERCISE, TREAT ANY UNDERLYING MEDICAL ISSUES, AND KNOW WHEN TO SAY NO.**

While treatment for fatigue is often very simple to describe, it can be difficult to execute. Recognize that no one is immune. Caffeine and other stimulants can mask symptoms but do not cure fatigue or sleep debt. Get adequate sleep and exercise, treat any underlying medical issues, and know when to say no. Luck should not be part of the planning process.

Leo M. Hattrup, M.D., received a bachelor's degree from Wichita State University, a master's in public health from Harvard University, and a doctorate from Vanderbilt University. He is retired from the U.S. Air Force, in which he spent the majority of his career in aerospace medicine. He is board-certified in aerospace and occupational medicine. He is a certificated flight instructor and enjoys flying airplanes, helicopters, and gliders.

LEARN MORE

FAA Safety Video: "Grounded — A Story of Fatigue"
bit.ly/FAAFatigueVideo

FAA TV: Fatigue in Aviation
bit.ly/FAATVFatigue

FAA Fatigue FAQs
bit.ly/FAAFAQsFatigue

AC 120-103A, *Fatigue Risk Management Systems for Aviation Safety*
bit.ly/FAAFatigueRiskAC

FAA Fatigue Risk Management
www.mxfatigue.com

FAA Fatigue in Aviation Brochure
bit.ly/FAAFatigueInAviation

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Your Airframe and Powerplant SUPERHEROES

A Celebration of Outstanding Certificated Aircraft Mechanics

By Jennifer Caron

AeroGuard Flight Training Center's repair station and its aircraft interiors and maintenance services both received the FAA's AMT Employer Diamond Award of Excellence in 2019. The FAA honored their Flight Training Center again in 2021 when they received the AMT Diamond Award for their fourth consecutive year.
Photo Credit: Courtesy of AeroGuard.

"The measure of achievement is not winning awards. It's doing something that you appreciate, something you believe is worthwhile."

— Julia Child

"It's not just doing the work of a mechanic — you can do that on a car. You need to have a love for aircraft," explains Mike Dunkley, the 2021 National General Aviation Technician of the Year.

Aviation maintenance technicians (AMTs) are a unique breed of consummate professionals dedicated and proud to serve as safety stewards of the sky. Without their work to inspect, maintain, and repair aircraft, coupled with their commitment to continue learning and sharpening skills, our lives (and our aircraft) would be at risk.

No one works in aviation maintenance to get an award. Technicians do it because they like the work and find personal and professional satisfaction in the crucial responsibility of aviation safety. An award is just the icing (albeit the delicious part) of a multi-layer cake — with inspiration and motivation on the bottom, hard work, training, and accomplishments in the middle, years of commitment to the craft, inspiration to others, and dedicated service on the top.

Award-winning technicians like Dunkley were chosen from their peers to recognize their distinguished careers and long-term contributions to general aviation safety, education, and professionalism.

Let's take a look at three top FAA award programs that celebrate our airframe and powerplant superheroes:

The Charles Taylor Master Mechanic Award

The National General Aviation Technician of the Year Award

The William (Bill) O'Brien AMT Awards Program

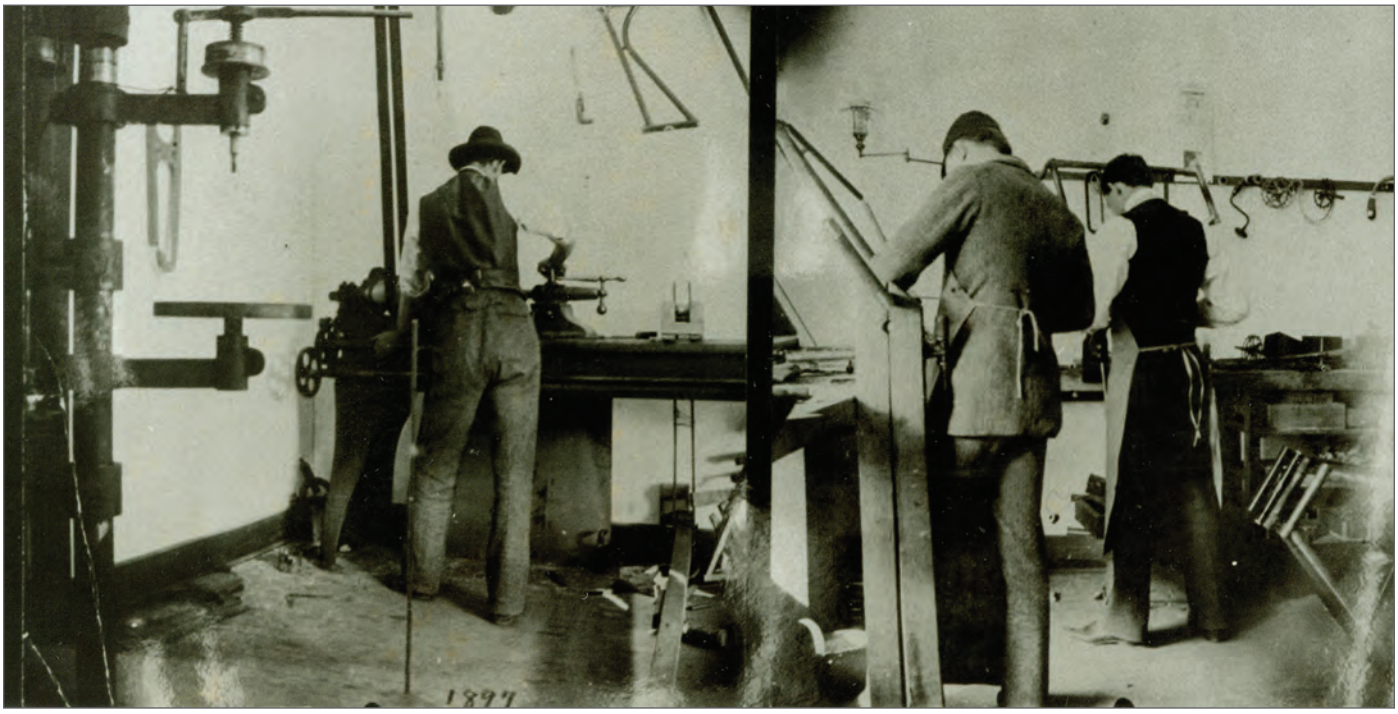
Not Just "The Third Man" — The Best Man

The ***Charles Taylor Master Mechanic Award*** acknowledges the lifetime accomplishments of senior mechanics. It's the FAA's most prestigious award for aircraft mechanics industry-wide, recognizing individuals who have exhibited professionalism, skill, and aviation expertise for at least 50 years in the aircraft maintenance profession.

The award was named to honor Charles E. Taylor, the first aviation mechanic in powered flight who designed and built the engine for the Wright Brothers' first successful aircraft. Immortalized as the "unsung hero of aviation," Taylor was self-taught, uniquely talented, yet overwhelmingly modest. He never sought any accolades for his due credit. But it was *his* hand-crafted engine that forever changed our world and propelled the Wright Brothers into transportation eternity.

The awards are processed year-round whenever an application is submitted.

Each Master Mechanic Award recipient receives a certificate of achievement, signed by the FAA Administrator. The FAA presents the award wherever the recipient prefers.



Charles Taylor and the Wright Brothers at work in the bicycle shop, 1897.

> **"Take a moment to give positive feedback. Don't wait for a mechanic to change an engine in record time before commending great, conscientious, safety-minded work."**

Many choose to receive their prize at the Sun 'n Fun International Fly-In and Expo award ceremony in Lakeland, Fla., and on occasion at other major aviation events.

Names of the Master Mechanic and Master Pilot award recipients are added to the FAA's online Roll of Honor. You can find the list of all current and previous award holders online at FAASafety.gov and every year in the March/April edition of *FAA Safety Briefing*. See page 26 for this year's Master Mechanic and Master Pilot Award achievers!

"Accolades like the FAA Charles Taylor Master Mechanic Award are excellent examples of significant positive feedback to help aviation mechanics appreciate their roots, their technical heritage, and the importance of their dutiful, safety-minded work," says Dr. Bill Johnson, 2020 Master Mechanic Award recipient. "Our work is full of daily, safety-critical activities that surely benefit from an occasional 'job well done.' Take a moment to give positive feedback. Don't wait for a mechanic to change an engine in record time before commending great, conscientious, safety-minded work."

For more information about eligibility, nominations, or applications for the FAA Charles Taylor Master Mechanic Award, visit FAASafety.gov/content/MasterMechanic.

And don't forget — May 24th (Charlie Taylor's birthday) is Aviation Maintenance Technician Day. Spend some time saying thank you to the men and women you know in the maintenance profession.

The Best of the Best

The ***National General Aviation Technician of the Year*** is awarded to general aviation pros in three categories: Aviation Technician of the Year, Flight Instructor of the Year, and FAA Safety Team (FAASTeam) Representative of the Year to acknowledge their contributions to aviation, education, and flight safety.

In a cooperative effort between the FAA and the aviation industry, the General Aviation Awards Program, comprised of volunteer board members and judges, administers the program to recognize the great work of their fellow aviators.

"They probably don't think of themselves as national winners, but rather as aviation professionals who work hard to serve their clients and improve our industry. These are the kind of people we want to select to represent their peers and our industry," says Arlynn McMahon, Nominations Coordinator of the General Aviation Awards Program Committee.

National Award winners receive gifts from sponsors and contributors (such as the King Schools, AOPA, and NAFI) and funds towards a trip to the awards ceremony at EAA AirVenture in Oshkosh, Wisc. There, the FAA presents each winner with individual plaques and a certificate of merit signed by the FAA administrator. Each recipient has their name added to the large perpetual plaque located in the lobby of the EAA AirVenture Museum. You can find all the current and prior award winners online at generalaviationawards.com.

"This program is unique because both the FAA and industry seek out those individuals who possess the traits that are seen as 'the-best-of-the-best,'" says McMahon. "It's a 50-year program, and it's still valid today because holding the bar high, being the best, and striving for excellence is always in style."

As of this writing, the committee has not yet chosen this year's National Aviation Technician of the Year, but check out generalaviationawards.com to find the winner and learn more about their road to excellence. You can also join us at the awards ceremony at EAA AirVenture in July to meet and congratulate all of this year's National General Aviation Award winners in person.

If you know an AMT who you think deserves recognition with a Master Mechanic or National Award, we encourage you to nominate them. Or, if you are an aviation professional with a distinguished career, don't hesitate to apply. You never know — you might just get the icing on the cake!

For more information about eligibility, nominations, or applications, visit generalaviationawards.com/nominations.

Above and Beyond

Last but not least is the ***William (Bill) O'Brien AMT Awards Program*** that recognizes and rewards AMTs and their employers for excellence in aircraft maintenance and their commitment to aviation safety.

Named for the late Bill O'Brien, who was a FAA national resource specialist and instrumental in establishing the FAA's Charles Taylor Master Mechanic Award, O'Brien ini-

tially conceived the AMT Awards Program in 1991.

The AMT Awards Program is an online automated training program to encourage AMTs (A&P Mechanics and Avionics Technicians) and employers to seek and complete training courses to enhance safety and improve their professional knowledge. The program awards eligible AMTs and employers who receive, promote, or foster initial and recurrent training.

> **No one works in aviation maintenance to get an award. Technicians do it because they like the work and find personal and professional satisfaction in the crucial responsibility of aviation safety.**

"We specifically tailor the initial and recurrent technical, safety-related, regulatory, and human factors training for you, the AMT," says Guy Minor, Aviation Safety Inspector and FAA Safety Team (FAASTeam) Airworthiness Program Manager.

Technicians who successfully meet the program requirements within a given calendar year will obtain an AMT Award certificate of training based on the number of training hours. Bronze Award (12 hours), Silver Award (40 hours), or Gold Award (80 hours plus three college credit hours or 40 hours in a career-related subject).

"One of the best features, other than the training itself, is a personalized training record, and it's free. Once you register on FAASafety.gov, you can document your training and awards by year. The website stores everything in your permanent training record," says Gary Knaggs, FAASTeam Aviation Safety Inspector.

The program has several levels, or phases, of recognition for both you and your employer. Aviation maintenance companies that initiate and sustain highly effective training programs to improve safety, quality, reliability, and technical knowledge, and exceed standard FAA regulatory requirements, are recognized with a Gold or Diamond Award of Excellence. The type of award is based on the number of technicians in the company who receive an individual AMT award each year.

Photo courtesy of Aviation News, Ltd.

Aircraft Propeller Service received the FAA's AMT Gold Employer Award in 2018 from FAA Safety Team Representative Lee Stenson.

AMT Employer Gold is awarded to eligible employers with a minimum of 50% of its eligible employees receiving an individual AMT Certificate of Training in a calendar year. Diamond Awards are given to employers with 100% of its eligible employees receiving an individual AMT Certificate of Training in a calendar year.

In 2021, AeroGuard's Flight Training Center received the FAA's AMT Employer Diamond Award of Excellence for its fourth consecutive year. AeroGuard was also honored in 2019 when their Flight Training Center's repair station and aircraft interiors and maintenance services both received the AMT Employer Diamond Award. All 40-plus AeroGuard maintenance employees completed a minimum of 12 hours of additional training in subject areas like aircraft systems, workplace safety, and regulatory compliance.

"Our staff understands the importance of safety, quality, and professionalism, and the Award is a testament to their hard work and dedication," says Shawn Rockey, AeroGuard's director of maintenance.

Employers who participate in the AMT Award Program demonstrate their commitment to the continued safety of the aviation maintenance industry. Visit FAASafety.gov/AMT/amtinfo to learn more.

Here's how AMTs can participate in the awards program.

- Register on ***FAASafety.gov*** to enroll in the awards program.
- Complete the online Core Course — *Ethics for Aviation Maintainers* (ALC-718). Each year there will be one or two new required core courses. Click on the *Maintenance Hangar* tab, then *My AMT,* and you'll find it under *Core Training Courses*. This course introduces seven key principles of ethical behavior and a moral decision-making framework for making mindful decisions based on the seven ethical behaviors.
- Eligible training also includes aviation maintenance career-related training in technology, human factors, and certain courses from an accredited trade school or university.

Train From Home or Hangar

You'll also find thousands of free, online safety and risk reduction seminars and webinars that you can attend virtually. There are online courses available too. Most are free or low-cost.

Need to renew your inspection authorization? There's a list of IA renewal courses and programs as well.

Take a look at the special training projects on risk management and human error in the maintenance hangar

tab, and you'll also discover resources on everything from maintenance alerts and safety tips to standards, regulations, and scholarships for up-and-coming mechanics.

If you have any questions or need help, ***contact Guy Minor at Guy.D.Minor@faa.gov***.

The learning process never ends. Keep an open manual and an open mind. As the Mechanic's Creed says, "… the safety and lives of others are dependent upon (your) skill and judgment."

Jennifer Caron is *FAA Safety Briefing*'s copy editor and quality assurance lead. She is a certified technical writer-editor in the FAA's Flight Standards Service.

LEARN MORE

FAA Information and Services for Mechanics
faa.gov/mechanics

Prior Recipients of the National General Aviation Technician of the Year Award

2021
Michael Dunkley
of Coshocton, Ohio

After four decades of learning, performing, supervising aviation maintenance, and maintaining a fleet of aircraft for the Mission Aviation Fellowship, Mike now spends his workdays passing his knowledge and experience to many young apprentices.

2020
Dennis Robert Wolter
of Cincinnati, Ohio

Between 1994 and 2013, beginning with the "Better Than New 172," Dennis was asked by AOPA an unprecedented five times to renovate the interiors of AOPA sweepstakes airplanes, often involving custom installations and FAA field approvals.

2019
Jon David Monti
of Gardnerville, Nev.

Dave was an integral part of the instructional staff for the Bonanza Pilot Proficiency Program since 1988, providing recurrent training for owners of Beech Bonanza, Baron, and Travelair airplanes, serving as their lead maintenance instructor and inspector. Sadly, we lost Dave in 2019, but his substantial contributions to the maintenance world will carry on for many generations to come.

2018
C. William Pancake, Jr.
of Keyser, W.Va.

In 2006, Bill received the Charles Taylor Master Mechanic Award and the Wright Brothers Master Pilot Award. When Bill received these awards, he was one of only 40 U.S. airmen to have received both awards and the only West Virginian to do so. In 2008, Bill was inducted into the EAA Vintage Hall of Fame.

2017
Brian John Carpenter
of Corning, Calif.

In 1991, Brian opened his own aviation company, Rainbow Aviation Services. He has given back to the aviation community as an EAA Technical Counselor, presents workshops, forums, and seminars for various aviation events, authors aviation educational articles and videos, and serves as a volunteer technical expert for EAA's Homebuilder's Tips video series.

Visit generalaviationawards.com to learn more about what makes these and all prior national award winners the best of the best.

U.S. Department of Transportation
Federal Aviation Administration
ADS-B Performance Monitor

Public ADS-B Performance Report

ICAO: A5BEC0 (51337300) **Tail Number:** N47 **Last Flight Id:** N47
Period: 03-23-2018 13:11:20 to 03-23-2018 13:59:29

Operation Analysis Overview

	Analysis
Airborne 1090	☑
Surface 1090	☐
Surface RWY/Taxi 1090	☐
Airborne UAT	☐
Surface UAT	☐
Surface RWY/Taxi UAT	☐

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faa.gov/go/adsbpapr

Federal Aviation Administration

ADS-B

SEE AND BE SEEN

Not Just Your Average Mechanic

Aviation Maintenance Technicians Have the Most Important Job In Aviation

By Jennifer Caron

So when you see mighty aircraft, as they mark their way through the air, the grease-stained man with the wrench in his hand is the man who put them there ...

— **A Tribute to the Forgotten Mechanic**, *Author Unknown*

What comes to mind when you think of an aviation mechanic? Do you picture a grease-stained guy in grimy overalls, cleaning his hands with a rag, as he critically walks around your aircraft looking for any problems he can find to justify the steep bill he's going to hit you with before you can get your bird back in the air? Or do you picture a highly-skilled, highly-trained, and well-educated aviation professional whose mission is to find and prevent problems before they happen and to whom you must trust your life?

Although pilots receive a lot of the glory, aviation safety is not just about an ace in the cockpit. It's also about a properly maintained and airworthy airplane that is as dependent on the technicians who service and repair it as it is on the pilots who operate it. I will argue that pilots need mechanics more than mechanics need pilots.

Aviation maintenance technicians (AMTs) are the unsung, often forgotten men and women where "everybody *only* knows your name" when something breaks or goes wrong. It's hard work — behind the scenes, under the cowling in the drafty hangar with the rattling doors and dangerous chemicals, making life or death decisions under mounds of paperwork and pressure to meet the standards and the deadlines, and balancing the tensions between safety and cost to keep the customer happy.

From Pulling Panels to Signature Authorizations

AMTs are not just your average run-of-the-mill mechanics. They are held to the highest standard of safety. AMTs start with a rigorous FAA training and certification process, and they don't stop learning until they retire. Their work is detailed, regulated, and stringent. They use a laptop as much as they use a wrench. Even routine tasks are step-by-step, and to the letter with secondary systems and redundancies in place, so there's no room for cutting corners or making mistakes. From pulling off panels, to diagnosing complex flight management systems, to signing

off on inspections; these skills can take years of service, training, and education to develop and master. It takes a great deal of work, growth, and dedication to be an AMT. AMTs perform a vital service that is not only critical to safety but also to the economy.

Fusing it All Together — It's Riveting

"My dad was in the Air Force as a crew chief on the B-36 [Peacemaker]," says Alby Redick, President of Aviation Classics, Ltd. in Reno, Nev. "I have always loved flying and working on aircraft. I was just born into it."

Ask any AMT, and they can tell you what inspired them to pursue their career in aviation. For some, it was their natural ability to fix things, taking them apart and putting them back together again — the right way. Still others, who could tell aircraft types just by the sound they made, were always curious to learn the principles of flight and the forces that keep the metal birds in the sky. AMTs eat, breathe, and sleep airplanes, and they're never afraid to get their hands dirty.

"I was an apprentice mechanic when I was in high school," says Guy Minor, former AMT and current aviation safety inspector and FAA Safety Team airworthiness program manager. "I remember one day I'm lying under the belly of a *Champ* cleaning oil off the airplane with a dry rag in one hand and a rag soaked in solvent in the other, doing 'wax on, wax off,' while the oil and solvent are just running down my arms. I looked up and thought, 'you know, I would never do this on a car.' Airplanes are magic; they're special; they're alive."

Our first aviation mechanic, Charles E. Taylor, who designed and built the engine for the Wright Brothers' first successful aircraft, knew from an early age that he was a born problem solver and mechanically inclined. That's lucky for the Wrights because there were no regulations, manuals, or manufacturer instructions to follow in those days. Charlie had to diagnose and troubleshoot on the fly, making repairs as problems occurred.

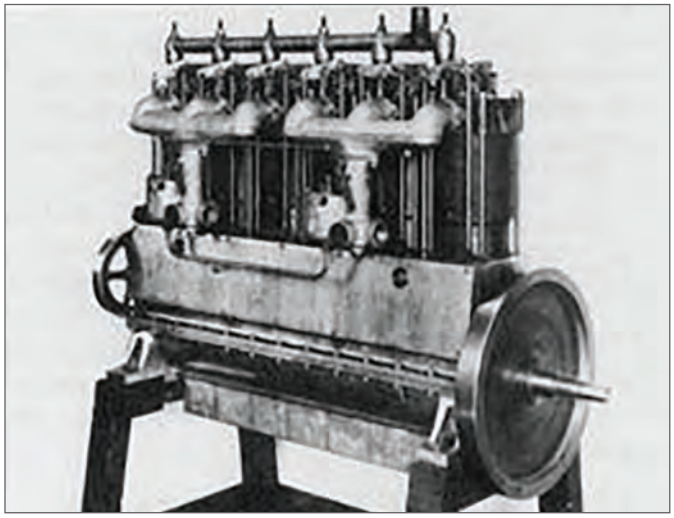
All of that would change. In 1927, the newly created Aeronautics Branch of the Department of Commerce issued the first federal aircraft mechanic license, which required mechanics who repaired air commerce aircraft to secure either an engine or an airplane mechanic's license, or both. The Branch also issued the first air commerce regulations and the first airworthiness type certificate for the Buhl *Airster* CA-3, a three-place open biplane.

A Day at the Beech

Since then, aviation maintenance techniques, technology, and safety have advanced and evolved. "Not much has changed as far as engines go. Nearly everything in the internal combustion line is still old school technology," says Ken Kelley, former AMT and current aviation safety inspector and FAA Safety Team airworthiness program manager. When it comes to repairing a Beechcraft, Cessna, or Piper, those airplanes are still straight out of the 1970s or earlier. "They might have real fancy avionics packages, or an electronic ignition or fuel injection, but the engine designs are still the same — right out of WWII and haven't changed much," says Minor.

In the not-so-distant past, analog and mechanical systems, affectionately known as "steam gauges," were the norm. Using push-to-test problem solving, mechanics would gauge when a component was close to the limit and replace parts before they wore out. They relied on their senses as well to diagnose and troubleshoot. "Your senses tell you a lot about the airplane. You can smell things when they're hot or if an engine is worn out or low in oil, it has a certain smell," Minor explains.

These sensory techniques have not changed; they're just another wrench in the toolbox for AMTs who have to be up to speed on all types of aircraft, from legacy platforms on aging aircraft to the latest bells and whistles in glass cockpit technology.



A late-model Wright "6-60" six-cylinder engine, circa 1915, built by Charles Taylor. This was one of the last engines produced by the Wright Company.
Credit: Courtesy of wright-brothers.org.

Many of today's airplanes are run by computers, and mechanics are retrofitting older aircraft with electronic instruments. Nowadays, AMTs use a laptop to diagnose complex navigational databases or flight management systems. Still, it's also vital for AMTs to rely on their core safety culture skills.

> **"I've been doing this a long time, but I'm still learning, and I still have to check myself. Are there habits and practices that have crept into the work that could leave you complacent? For example, many annuals are performed on the same aircraft by the same person year after year. Perform every third 100-hour inspection by a different person to get a different perspective. Don't get stuck in a rut, be curious, avoid disruptions, and never assume. Ask questions and verify."**
>
> **Michael Dunkley, 2021 National Aviation Technician of the Year**

New technology and innovation have propelled safety and progress. "The major advancements are tied to newer technology in the accessory side of things," explains Kelley. "We have electronic ignition coming up more and more and better electronic engine monitoring systems that allow us to spot problems before they morph into major issues. FADEC, full authority digital engine control, shows up in the newer aircraft built today. More advances with fuel, ignition, and air and power management have made the older engines more economical to operate and more consistent with power output," he says.

"With regard to preventive maintenance," says Kelley, "new technology, like advanced monitoring systems for exhaust gas temperatures (EGT), RPMs, oil temperatures, and cylinder temperatures, has allowed us to see issues in performance and instrumentation so that we can address a problem before it becomes a catastrophic failure. Identifying issues and fixing them before they turn into major problems saves us money, reduces the aircraft downtime, and helps to get an engine to TBO [time between overhauls] without costly failures."

Torquing Bolts and Typing on Keyboards

"Of course, the computer and internet have made the largest impact in the hangar," says Redick. "We now have computer terminals set up around the shop for our guys: no more paper slips or paper tracking. We have computerized maintenance and parts manuals, technical publications, inventory, logbook entries, and FAA Form 337s, to name a few," he explains.

"When I started back in 1983, all the data was stored on microfiche and in paper books. It may as well have been carved into stone tablets when we compare that to what we have now. AD [Airworthiness Directive] and Service Bulletin research takes a fraction of the time to complete now versus 20 to 40 years ago. Improved tooling like affordable,

The hangar at Aviation Classics, Ltd. in Reno, Nev.
Credit: Photo courtesy of Aviation Classics, Ltd.

flexible borescopes and digital micrometers make the job of inspecting hard-to-see places much easier to accomplish without any real disassembly of components. Measuring the wear on parts using optical devices has improved, and electronic measuring equipment has made our results much more accurate," says Kelley, who owns and maintains a Cessna 172N.

An AMT is a jack of all trades and every day in the hangar or on the flight line presents a new challenge and a new opportunity to develop skills while crawling over different aircraft. "It really helps when your mechanics can work on diverse projects, as opposed to working a narrow scope of services," says Redick, who credits the success of his shop on the diversity of services that they offer.

Math — It's Not Just for Wrenches

The maintenance industry is evolving and diverse, yet at the same time, baby boomer mechanics are retiring in large numbers. We've got a shortage today that's projected to shrink the workforce of tomorrow. Add to that a reduction of students entering AMT schools, coupled with graduates taking jobs in other higher-paying fields such as robotics and hydraulics, and you're looking at a shortfall that's affecting MROs and mom and pop shops alike. AMTs need to share their passion and knowledge with the next generation and promote education in science, technology, engineering, and math (STEM) to help ensure a pipeline of qualified AMTs for the future.

> **AMTs should assist owners and encourage owner-assisted annuals. Don't take your knowledge to the grave; pass it on to the next generation.**
>
> **Dennis Wolter, 2020 National Aviation Technician of the Year**

"Most kids want a clean job and don't seem to want to have to get their hands dirty, but fortunately, there are some that still love doing so. Tech schools are a good start; STEM programs are great," says Riddick, who believes it all comes down to work ethic. "If a young person loves electronics, encourage them to become an avionics installer, bench technician, or a mechanic trainee."

The demand to fill these STEM-related jobs exists right now, and the need is only growing. This year, the FAA awarded $5 million in aviation workforce grants to train the next generation of AMTs. (*See this issue's ATIS department for details.*)

"In the old days, the diesel and car mechanics had a much better paying job," says Riddick. "The upside to the shortage and increased demand in our industry is that wages have finally come up to a more livable wage."

Snap-on Tools of the Future

We're looking at a future of new-generation aircraft, aircraft engines, propellers, and appliances manufactured using advanced materials, processes, and equipment, calling for more advanced maintenance techniques.

If you've ever had an MRI or a CT scan at the doctor, then you've got an idea of how Nondestructive Inspection and Testing work. NDI and NDT are similar techniques using X-Rays or ultrasonic equipment to inspect and verify the condition of aircraft, engines, propellers, and other aviation components without causing any damage. It's accurate, cost-effective, and preventive and allows technicians to get a look inside before replacing or repairing components.

FedEx uses drones to inspect exterior surfaces on aircraft in their fleet, which increases data collection and quality, improves employee safety, takes inspection times down from three hours to 20 minutes, and allows AMTs to focus on more specialized jobs.

Additive Manufacturing (AM) technology is a new process to join materials to make aircraft parts using data from computer-generated 3-D models. In that same vein, AI, artificial intelligence, is now being used in predictive maintenance.

Kelley, an avid Star Trek fan, is excited for the future of aviation maintenance. "When you add in the advancements in composite structures and metal spray to repair fan blades and internal engine components, it's easy to see that in another decade, the aviation environment will be much different than what it was a short time ago. Now, if I could just remember where I put the dilithium crystals and the plasma couplers!"

Jennifer Caron is *FAA Safety Briefing*'s copy editor and quality assurance lead. She is a certified technical writer-editor in the FAA's Flight Standards Service.

FRANKENSTEIN'S AIRPLANE

The Sometimes Tricky Business of Modifying Aircraft

By James Williams

The Frankenplane is a concept *FAA Safety Briefing* first explored in the 2014 article "Beware the Frankenplane!" (See our May/Jun 2014 edition at bit.ly/FAASB-Arc.) It alludes to Mary Shelley's 1818 novel *Frankenstein* or *The Modern Prometheus.* Shelley's work tells the story of Dr. Victor Frankenstein, who creates a monster through a secret process of imparting life to non-living matter. The creature's large size arose from Frankenstein's difficulty replicating the body's tiny structures. Later Hollywood versions changed this slightly to cadaver parts and electricity. The original novel and subsequent movie versions diverge significantly from this initial setup. But if you are considering modifying an airplane and looking to buy or even fly a modified plane, there may be some lessons here.

The idea of modifying aircraft can be powerful. But while we aren't Dr. Frankenstein in his lab, we may create a monster if we aren't careful. Certified aircraft can be modified via Supplemental Type Certificates (STCs). (We recognize there are other means to modify aircraft, but we'll focus specifically on STCs for this article.) STCs are additions to the aircraft's original Type Certificate (TC) that allow for changes to the original design. STCs impact pilots, aircraft owners, and aviation maintenance technicians (AMTs), as each plays a role from selection to installation to operation. These impacts are usually pretty manageable for a pilot, i.e., an updated weight and balance or new operating manuals or procedures. In the case of single STCs, you can usually work with them pretty easily. But when you start layering STCs, the Frankenplane comes into play. Let's examine two examples that proved fatal to their pilots.

"Beware; For I Am Fearless and Therefore Powerful"

Our first example is a classic Frankenplane that shows where the power of fearlessness may lead. In 2010, a Cessna T337G suffered an inflight breakup caused when the pilot exceeded maneuvering speed while pulling up from a high-speed low pass at Monmouth County Executive airport. Contributing to the accident was the fact that the aircraft had 22 different STCs applied to it, some of which appeared to have weakened its structure.

While this is an extreme example, it illustrates the danger: an STC is usually evaluated in isolation, meaning one STC on an original aircraft. It can be perfectly reasonable to have more than one STC on an airplane, but it is crucial to consider the impact of layering STCs and how they might interact. Much as a pilot must consider how various medications might interact, the owner and installer must consider whether multiple STCs interact.

For example, an upgraded seatbelt kit is unlikely to interfere with extended wingtip fuel tanks, but those same extended fuel tanks may not work as well with a short take-off and landing (STOL) kit. In this case, the National Transportation Safety Board (NTSB) discovered skin fatigue cracks that indicated the airplane was subjected to vibratory stress. While these cracks didn't contribute to the accident, it shows that not all was well with the aircraft.

"Man, How Ignorant Art Thou In Thy Pride of Wisdom!"

Our next example is more subtle, but it still illustrates the danger from physical damage after multiple STCs and ignorance of how they interact. In 2010, a Beechcraft *Baron* suffered a loss of control in flight and crashed, killing both on board. The pilot was undergoing a multiengine instrument proficiency check at the suggestion of his insurance company after repurchasing the airplane 22 years after selling it to another owner.

Two STCs were completed after the accident aircraft was sold. The first was the installation of vortex generators that lowered the aircraft's minimum single-engine controllable airspeed (V_{MCA}) from 81 knots indicated airspeed (IAS) to 74 knots IAS. The airspeed indicator was corrected to reflect this change. An STC almost ten years later covered upgraded engines, propellers, nose cowlings, and winglets. Part of the STC process was to change the V_{MCA} from the

original TC value of 81 knots IAS to 87 or 88 knots IAS. However, the airspeed indicator was not updated; it still showed the V_{MCA} of 74 knots IAS from the first STC.

The second STC also contained the following passage in its Limitations and Conditions section: "This approval should not be extended to other aircraft of this model on which other previously approved modifications are incorporated unless it is determined by the installer that the interrelationship between this change and any other previously approved modifications will not produce an adverse effect upon the airworthiness of that airplane …." The events of the checkout flight prove the wisdom of heeding those conditions.

According to radar tracks, the flight continued into what appeared to be low-speed airwork, with the last reported ground speed measuring 71 knots. Witnesses reported seeing the airplane flying level before it descended in a left spin and impacted a house. Extensive fire damage to the wreckage prevented a more thorough investigation, but it appeared that there was no pre-impact failure or malfunction of the observed components. Based on the purpose of the flight and radar tracks, the NTSB determined that the pilot likely was performing either imminent stall or simulated loss of engine power airwork before the aircraft stalled and entered a spin.

Because the two STCs had never been flight-tested in combination, there was no performance data to determine the aircraft's V_{MCA}. The NTSB, however, determined V_{MCA} was likely higher than the 74 knots IAS on the airspeed indicator. After the second STC was installed, the previous owner had safely operated the plane for more than a decade. A little more knowledge on the part of the original owner could have prevented this tragedy.

Caveat Emptor!

The STC process is an excellent tool for modernizing and increasing the capabilities of older aircraft. But caution is well warranted whether you're approaching these aircraft from the perspective of a pilot or an owner. If you see an airplane that has STCs, especially one with multiple STCs, it's time to investigate and ask questions. While the installer of each STC is responsible to determine whether the design change is compatible with any previously approved modifications, this may not always happen. When in doubt, have a qualified maintenance professional review not only the physical aircraft but also the maintenance records which should contain any modifications or alterations to the aircraft. The more extensive the modification(s), the more time is likely warranted. If you are looking to purchase an aircraft, contact someone knowledgeable of the type who can help you sort through which modifications could be a boon and which are Frankenplanes in waiting.

Remember that the monster of Mary Shelley's novel was intelligent, articulate, and could even be considered kind until the villagers mistreated him. Even potential Frankenplanes can be good aircraft when treated with the proper respect.

James Williams is *FAA Safety Briefing*'s associate editor and photo editor. He is also a pilot and ground instructor.

FAA Photo by Bryan Dahlvang.

Keeping the CAP Fleet *Fit*

How CIVIL AIR PATROL Maintains Their Planes

By Paul Cianciolo

Photo courtesy of Civil Air Patrol.

More than 92,000 flight hours a year may seem like a daunting number, but that is the norm for Civil Air Patrol's (CAP) auxiliary airmen missions. Flying for the U.S. Air Force, states, and local communities puts quite a toll on CAP's fleet of small aircraft. Maintaining that fleet in peak condition is essential to mission readiness.

Elephant Walk

Let's first look at CAP's aircraft fleet by the numbers. With few exceptions, CAP owns and operates one of the world's largest fleets of piston-engine airplanes.

The low and slow high-wing platform is the top choice for search and rescue, route surveys, tracks of interest for air-intercept training, radio communication relays, short-range transport, aerial photography for damage assessments, and aviation training. CAP's fleet includes 190 Cessna 172 *Skyhawks*, 300 Cessna 182 *Skylanes* (including 14 turbos), three Cessna 185F *Skywagons*, 39 Cessna 206 *Stationairs* (including 26 turbos), 16 GippsAero GA8 *Airvans*, and three Maules. The fleet also includes two hot air balloons named *Integrity* and *Imagination*, 54 gliders, 938 FAA-registered drones for operational missions, and 1,391 FAA-registered drones for STEM education.

That's a lot of aircraft to maintain! Keeping 551 single-engine piston airplanes on the line and ready for flight is centrally managed by a small team of employees at CAP's National Headquarters and aircraft maintenance officer (AMO) volunteers around the country.

Above and Beyond

Each AMO is the single point of contact for all maintenance performed on the aircraft within CAP's 52 wings — one for each state, one for Puerto Rico and the Virgin Islands, and one for the D.C. metro area. They coordinate all aircraft maintenance, inspections, and repairs, and they ensure all aircraft meet FAA standards under 14 CFR parts 43, 45, and 91. AMOs are not required to be qualified as FAA-certificated aviation maintenance technicians (AMTs).

Photo courtesy of Civil Air Patrol.

Still, AMOs are fully trained within three months of taking on that volunteer duty assignment.

One of an AMO's tools is an enhanced aircraft inspection checklist — CAP Form 71.

"The checklist is used to evaluate the overall condition of the airplane, verify the configuration, and to ensure compliance with both FAA and CAP regulations," explains Gary Schneider, CAP's director of logistics and mission resources. "It's only required once a year, but many of our AMOs like to use it each and every time an aircraft goes in for its 100-hour inspection."

Using a checklist is always a good idea. There are above and beyond items worth noting to keep the fleet better than good.

Aircraft assigned to Florida, Hawaii, and Puerto Rico wings require the application of a corrosion preventive compound at least annually. Others must apply it every two years. Also, any aircraft that flies 200 feet above ground level (AGL) over a body of saltwater or dry salt beds must be rinsed with clear water after each flight. When was the last time you washed your airplane? Learn more about corrosion control for aircraft in Advisory Circular (AC) 43-4B at bit.ly/AC43-4B.

Another preventative measure is against the silent killer, carbon monoxide (CO). According to the National Transportation Safety Board (NTSB), it has killed 42 people in aircraft accidents since 1982. That's why CAP requires a disposable CO detector in every powered aircraft, even if that aircraft is equipped with an electronic sensor. These are replaced every January or when one becomes unserviceable. Learn more about preventing CO poisoning at go.usa.gov/xtjAF.

The checklist also requires that specific placards always be visible to the pilot. One important one is "Remove Towbar Before Engine Start." *Yes, it happens*. Preventing damage beforehand is always a good thing.

Another requirement for CAP pilots is to check the aircraft tire pressure before the day's first flight. Being proactive with this small step can prevent a potential tire blowout. CAP pilots are also required to either use a CAP-approved checklist or the manufacturer's checklist. Additional checklist items for preflight, enroute, and post-flight are provided through operational standards.

These are just some proactive measures taken to safeguard and protect the aircraft.

Monitor and Verify

When maintenance issues happen — and they will — CAP requires all pilots to document, track, and report aircraft discrepancies using a web-based system that automatically notifies an AMO for validation. Differences are expected to be reported as soon as possible but no more than eight hours after being found. The AMO ensures that the entry accurately reflects the actual condition of the aircraft. If the cause cannot be determined and the aircraft is unsafe to fly, it is grounded until an airworthiness determination can be made by a certificated AMT.

All deferred maintenance items must meet the requirements of 14 CFR section 91.213(d) and be properly disabled or removed, and placarded. If a deferred item limits the ability of the aircraft to operate in a given condition, then the appropriate "limitation status" is selected in the online reporting system.

Photo courtesy of the U.S. Aviation Academy.

Photo courtesy of Civil Air Patrol Col. Jane Davies.

Keeping 551 single-engine piston airplanes ready for flight is centrally managed by a small team of employees at CAP's National Headquarters and aircraft maintenance officer (AMO) volunteers around the country.

"Our AMRAD [Aircraft Maintenance Repair and Documentation] system is a valuable tool. It allows our members and headquarters staff to monitor inspections, engine and prop overhauls, the accomplishment of Airworthiness Directives (ADs), and the overall status and condition of an aircraft," Schneider states. "Before AMRAD, it would be possible for a pilot to land an aircraft with a grounding discrepancy that could go unreported, and then the next pilot could fly an aircraft that was not airworthy and safe. A pilot could land an aircraft when a CO detector alerted to carbon monoxide in the cockpit, but neglect to placard the plane or notify maintenance before the next pilot unknowingly takes off with a potential CO hazard in waiting," he explains.

"A pilot can now enter a discrepancy in AMRAD from their cell or tablet, which notifies the AMO and signifies to a future crew that a plane is grounded. Like so many systems, the weak point is the human," continues Schneider. "If the pilot fails to document a grounding condition, it could still result in failure to notify the appropriate people. We have reduced the likelihood of that possibility."

Pilots must also receive a flight release from an appointed flight release officer (FRO) before any flight. The FRO ensures that the pilot thoroughly considers items like intended sortie parameters, weather, crew condition, and airworthiness. Both the pilot and the FRO have access to AMRAD to check for any known maintenance discrepancies as part of the preflight check.

Only the Best

CAP maintains a centralized maintenance program for all scheduled work and as much non-scheduled work as reasonably possible to provide the safest and most reliable aircraft to meet all mission requirements. CAP contracts with 80 aircraft repair shops around the country to ensure a consistent quality of work. A competitive process is used to evaluate different shops, including talking with local CAP pilots in the area.

"I ask if this is a shop that they would take their personal plane to," explains Schneider. "After we select the best shop, we consult with the wing to make sure they also agree with the choice."

CAP's consolidated program results in aircraft that are safer, airworthy, mission-ready, and better looking than before.

"Perhaps the best metric to show an improvement over the past is financial," Schneider notes. "Before consolidated maintenance, we used to pass appropriated funds out to the wings simply, and the money would be gone months before the end of the fiscal year. Now we stay within budget and can also perform refurbishment and avionics upgrades."

CAP aircraft are purchased and maintained through appropriated funds, which further safeguards federal dollars from misuse.

Civil Air Patrol auxiliary airmen take pride in their aircraft and maintain them to a high standard. Their volunteers serve our communities every day, saving lives and shaping futures.

Paul Cianciolo is an associate editor and the social media lead for *FAA Safety Briefing*. He is a U.S. Air Force veteran and an auxiliary airman with Civil Air Patrol.

LEARN MORE

CAP website
gocivilairpatrol.com

Why Do Good People Violate Procedures?

A Common Sense Look at Why Some Mechanics Are Prone to Bend the Rules

By Guy Minor

One weekend on a revenue flight, an aircraft enters a fog bank at a very low altitude. The pilot begins an immediate 180-degree turn to exit the fog. During the turn, the aircraft descends into the water and lands hard. Fortunately, the accident does not hurt anyone and just damages a very expensive turbine-powered floatplane.

Later, the operator sends a maintenance crew out to inspect the aircraft. They find the engine undamaged, but the impact has bent the fuselage. What to do? The crew is standing on the floats of a $1.5 million aircraft, bobbing about in the water. They understand it is against the rule to fly a damaged aircraft, but they also have the expertise to know the aircraft is safe to fly. They do not want to risk anchoring the aircraft overnight or tying it up to a stranger's dock. Disassembling it will take too long, and transporting the aircraft by ground will most certainly damage it even more.

It will be dark soon, and a ferry permit takes time to negotiate, so it will delay their recovery. After all, it's just a piece of paper, right? Its only purpose is to ensure that someone with expertise certifies the aircraft is in a safe condition to make the intended flight. With all this in mind, the team makes the decision to fly the aircraft home.

Later, when inspectors arrive to investigate the accident, they are surprised to find the aircraft at its base, safely in a hangar. You can imagine the conversation. Where was the accident? It happened out in the water. How did the aircraft get back home? We flew it back. You flew a damaged aircraft? May we see the ferry permit? You get the idea.

> **Procedure violation is not really about being a bad person. Reality is much more complex than that.**

In a study called "Bending the Rules: Managing Violation in the Workplace," Patrick Hudson, et al. (2005) points out that most people seem compliant, but they are willing to violate. He also identified four indicators of violation from his research on rule violation by offshore oil drilling crews: 1) expectation that the rules will have to be bent to get the work done, 2) the feeling that one has the ability and experience to do the job without slavishly following the procedures, 3) seeing opportunities for short cuts or to do things better, and 4) inadequate advance preparation, leading to working on the fly and solving problems as they arise. See the Learn More section at the end of this article for a link to the study.

So how do these four principles apply to the story of the floatplane? Did the recovery crew feel that bending the rules was required to get the job done? Probably, since it would have taken more time than they had available to wait for the permit. Waiting for a ferry permit would have delayed the work until it was too dark to use anyway. The problem was that even though they had made decisions based on the information at hand, in hindsight, they had not planned well prior to departing home base.

Put yourself in their shoes. Events tend to unfold one small piece of information at a time. More than likely, the indications prior to departing to inspect the aircraft were that the accident had damaged the aircraft too much for it to be ferried, so it is understandable why they did not obtain a ferry permit before departing. They were under intense pressure to get the aircraft to safety. The aircraft was too valuable to allow it to spend the night on the water. It was also much quicker to fly the aircraft home than disassembling it and trucking it home. This plan avoided the damage caused by transporting the plane by ground. The aircraft would be back flying its route in days, not weeks or months. This maintenance crew is the best floatplane crew in the world. They certainly possess the expertise to know if an aircraft is safe for a ferry flight. The outcome of the situation is that they were right; the aircraft did make it home uneventfully, just not legally.

Why Good People Do Wrong Things

Understanding why good people violate procedures is the first step to understanding what to do to prevent it. British psychologist James Reason divides unsafe acts into two categories: errors and violations. The prevailing doctrine in our industry is that the main difference between error and violation is intent. People do not intend to err, but violations are intentional. This makes the decision to violate a matter of choice, and if it is a matter of choice, then we must take responsibility for our choices. Since violating is very dangerous, we naturally attribute violation to the aviator's lack of character. Good guys and bad guys. Is it really that simple, though?

Certainly, there are people in aviation who are less than ethical. However, it is a pathological person who would think, "I'm going to set out today to make a mistake that will hurt customers or damage equipment. Maybe I'll ruin my career or kill myself today." People just do not think like that. When presented with a list of options, they struggle to pick the best one every time. For that reason, procedure violation is not really about being a bad person. Reality is much more complex than that. It is an uncomfortable fact that the last people you would ever expect to violate the rules, people who are hard-working, loyal, sharp technicians are the ones who commit the most violations.

We tend to avoid discussing the organizational conditions promoting violations. It is more common to attribute the source of violations to the violator's lack of character. This point of view ignores the possibility of violations that are more or less well intended, i.e., violations committed out of necessity or under pressure. Many of the same conditions that cause mistakes also cause violations, conditions such as low assertiveness, poor planning, lack of resources, poorly written procedures, poorly trained procedures, the list goes on.

Violating with Good Outcome

Situations such as the floatplane accident are far more common than we care to admit. The maintenance technician's world involves the expectation to "follow the rule to the letter, but use your common sense." New technicians who try to follow procedures learn very quickly that they need to use common sense and sometimes trade ethics for efficiency, or they will face frustrated managers who view them as inefficient, unproductive, and subject to termination. If the outcome of any particular task is good, managers and peers praise violating technicians as creative, efficient, and productive. However, if the task has a tragic outcome, the technician is a rule-breaker, negligent, and culpable.

We cannot as an industry change for the better if we continue to relegate violation to the shadow world. We need to drag it out where we can see it and deal with it. It is time to discuss violations openly. It is time to acknowledge that

Perhaps after their technical training, we should teach maintenance technicians, who are already technical experts, the non-technical skills they need to create safety and reduce unsafe acts.

violators are not a criminal class. It is time to understand the systemic pressures that influence good people to violate and teach managers to control and recognize these pressures.

So what is the solution? How do we control organizational conditions that influence unsafe acts? Sanne and Dekker point the way.

> *"We can make progress on safety once we acknowledge that people themselves create it, and we begin to understand how. Safety is not inherently built into systems or introduced via isolated technical or procedural fixes. Safety is something that people create, at all levels of an operational organization ... Safety is the emergent property of a system of people who invest in their awareness of potential pathways to breakdown and devise strategies that help forestall failure."*

Managers are most in control of the organizational conditions that influence unsafe acts, so it would be helpful for aviation managers to be good managers. The focus of aviation maintenance technician schools is to prepare students to be technical experts, not managers or leaders. The typical floor mechanic learns leadership from their parents, sports programs in school, scouting, and of course, supervisors they have known. Some of this training is good; some not so much.

Perhaps after their technical training, we should teach maintenance technicians, who are already technical experts, the non-technical skills they need to create safety and reduce unsafe acts. Mechanics need leadership skills such as assertiveness, planning, time management, business writing, public speaking, safety ethics, and labor law, to mention just a few helpful topics. Teaching these non-technical skills along with the more technical skills such as safety management systems, human error fundamentals, and performance rules would help equip managers to operate with more confidence and assertiveness in the boardroom and on the shop floor.

Guy Minor is an FAA aviation safety inspector and FAA Safety Team airworthiness program manager.

LEARN MORE

Bending the Rules: Managing Violation in the Workplace
bit.ly/BendingWorkplaceRules

ROLL of HONOR

Wright Brothers *Master Pilot Award*

The FAA's most prestigious award for pilots is the Wright Brothers Master Pilot Award. It is named in honor of the first U.S. pilots, the Wright brothers, to recognize 50 years of exemplary aviation flight experience, distinguished professionalism, and steadfast commitment to aviation safety. In 2021, we recognized the following Master Pilots. For more about the award, go to FAASafety.gov/content/MasterPilot.

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Darrell Holmstrom	AK	Richard Lee	AZ	Douglas Johnson	CA	David Sprague	CO	Forest Jacobs	FL
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Charles Taylor *Master Mechanic Award*

The FAA's most prestigious award for aircraft mechanics is the Charles Taylor Master Mechanic Award. It is named in honor of the first aviation mechanic in powered flight, Charles Taylor, to recognize 50 years of exemplary aviation maintenance experience, distinguished professionalism, and steadfast commitment to aviation safety. In 2021, we recognized the following Master Mechanics. For more about the award, go to FAASafety.gov/content/MasterMechanic.

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SUSAN K. PARSON

MAKING THE MOST OF MAINTENANCE

Sending your airplane to the shop for any kind of work — especially the dreaded annual inspection — is often a nail-biting experience for pilots. Even if you "know" that your trusty mechanical bird is running well, you also know that, as the saying goes, you don't know what you don't know. That was the case for my flying club a few years ago. At the time, we operated two airplanes: a C182 *Skylane* used for travel and training and a C150 for aerial joyriding. Because of its obvious size/weight limitations, the C150 didn't get as much flight time as it could — or should — have.

Are alarm bells sounding in your head? Somehow, we anticipated just a quick and routine annual when we sent our little bird off to the shop. I'll spare you the suspense: we spent well over $7,000 to get our airplane back in service. Aside from not flying much, never a good thing for airplanes, it seems that the Really Good Deal we had been getting on annuals and other maintenance wasn't such a good deal after all. Far too many issues had been overlooked or perhaps papered over. We were lucky. While the expensive annual was no fun, we wound up with an airplane that was truly airworthy — not just in the sense of having all the right documentation, but in the far more important sense of having an airplane in a safe condition for flight.

Lesson Number One for aircraft annual inspections and, in fact for many other aspects of life, is to be wary of a Really Good Deal. But there were other things we could have done. Here are a few of the lessons learned.

Fly the airplane! Life gets in the way of flying more than we might like. But if you own an airplane, letting it sit idle for long periods of time is not the way to ensure its longevity. Our C150 logged time in double digits. If you are tempted to address the issue by just running the engine(s) on the ground — don't! Running aircraft engines on the ground for any length of time before shutting down does not allow the engine oil temperature to get hot enough to boil off the condensation and other by-products of combustion. The most common result is corrosion in the cylinders.

Pay attention. When an airplane is as familiar as your favorite pair of comfortable shoes, it can be tempting to relax and assume all is well. But is it?

Let's start with the preflight inspection. Do you perform this task each time with care, or do you skim around the airplane without really looking because everything was fine the last time you flew? When I worked for a flight school, I taught students to use all senses. Does it look right? I required specifics — it wasn't enough to say "this" looks "okay." When you move control surfaces, do you hear anything unusual? Is there any sense of binding or resistance that should not exist? Smell is important too, especially for determining that you have the proper fuel.

Paying attention shouldn't stop with the preflight inspection. At every phase of flight, you should be alert to anything that doesn't fall into the normal range. You need to know what constitutes "normal" for your airplane. Keeping a log of key engine indicators for your airplane allows you to quickly spot anything "off" in the operation of a key instrument. The data can also help your maintainer diagnose the problem.

Postflight inspection is another opportunity to gather data that you and your maintainer can use. Too often after a successful flight, we simply secure the airplane and saunter away. But it's a great time to check to ensure that the airplane really will be ready for the next flight.

Susan K. Parson (susan.parson@faa.gov) is editor of *FAA Safety Briefing* and a Special Assistant in the FAA's Flight Standards Service. She is a general aviation pilot and flight instructor.

ARE DRONE PILOTS ALSO "MAINTAINERS"?

As spring approaches, the fair-weather flying opportunities are nearly upon us. It's a good time to retrieve your drone's operating manual and review the recommended maintenance checks from the manufacturer. As the drone's pilot, you are solely responsible for ensuring the overall safety of the flight. Checking your drone for defects prior to and after each flight (preflight and post-flight assessment), along with following manufacturers' maintenance recommendations, may keep your next flight from being your last.

> **AS A PREVENTIVE MEASURE, CONSIDER DEVELOPING A DRONE MAINTENANCE AND ASSESSMENT PROGRAM FOR THE OPERATION OF YOUR SPECIFIC DRONE.**

Have you ever finished a preflight assessment only to learn that there's something wrong with your drone and you don't have the correct spare parts to repair it? A preflight assessment is an excellent way to catch "day of" problems before they escalate into a hazardous situation. For those of us who don't always have essential replacement parts on hand, relying on a preflight assessment alone could lead to significant flight delays or even keep you temporarily grounded while you wait on parts. As a preventive measure, consider developing your own drone Maintenance and Inspection (M&I) program. An M&I program based on daily, weekly, and monthly checks will not only help keep your drone flying at optimal performance but also helps you catch problems before you head out for your flight.

A disciplined M&I routine, including checking the drone after it lands (post-flight assessment), can reveal problems well before they end up causing a safety issue during your next flight. Not all drone manufacturers have detailed maintenance instructions. For this reason, it is in every drone pilot's best interest to create an M&I program. It may be tempting to use a "one size fits all" template when researching drone maintenance programs. This approach is not practical given the variety of drone types and configurations. When creating an M&I program suitable for your situation, consider your particular drone's size, weight, power source (battery-powered vs. conventional fuel), and its unique technological capabilities.

Here are some maintenance best practices to ensure that your drone is in good working order and if repairs or replacements may be needed before your next flight. *See FAA Advisory Circular 107-2A Appendix E for a more detailed list of preflight/post-flight assessment and inspection checklist samples.*

Preflight Assessment:

- Verify that all the manufacturer-required components of the drone are present and operating as designed.
- Inspect the drone's structure, all flight control surfaces, and linkages for damage.
- Check propulsion system, including powerplant(s), propeller(s), rotor(s), ducted fan(s), etc.
- Verify that all drone systems have an adequate power supply for the intended operation and function properly.

Post Flight Assessment:

- Evaluate the drone to determine whether repairs are required before subsequent flights.
- Conduct a flight review to include any equipment malfunctions and anomalies.

Always record all concerns, repairs, routine maintenance, and feedback in a maintenance log to improve the safety of future flight operations.

So are drone pilots also maintainers? Yes! It is always the drone pilot's responsibility to ensure their drone is in a condition for safe operations. Remember, drone safety always begins with a good maintenance program and thorough preflight and post-flight assessments.

John Waters is a program manager for UAS support and outreach in the FAA's UAS Integration Office and previously worked as an air traffic control specialist.

TOM HOFFMANN

WHAT IT TAKES TO BECOME AN AIRCRAFT MAINTENANCE PROFESSIONAL

People with a passion for aviation can appreciate how addictive it can be. If you are one of those bitten by the aviation bug, you may find yourself studying an aircraft in flight and imagining how satisfying it would be to defy gravity at its controls. But, under the sleek, polished exterior cruising around the skies lies its heart: the mechanical system that is as dependent on the technicians who service and repair it as it is on the pilots who operate it. Mastering this complex system is an art as old as the Wright Flyer.

Whether you are a pilot with a penchant to go beyond the 31 preventive maintenance items allowed by regulation or someone whose goal is to be dedicated to practicing and advancing the science of aviation maintenance, it is important to know your options and requirements when considering becoming an FAA-certificated aircraft mechanic.

The Basics

You may be familiar with the two basic disciplines of an aircraft mechanic certificate: the airframe rating and the powerplant rating (A&P). Each part affords the holder a specific set of privileges and limitations. Here you'll find everything you need to know to become a mechanic as of this writing: faa.gov/mechanics/become.

For a mechanic certificate with A&P ratings, the FAA also requires you to pass not one, not two, but *three* separate sets of written, oral, and practical exams. These include one set for each airframe and powerplant rating and another for general knowledge tests. You can choose to obtain a single airframe or powerplant rating; however, most mechanics elect to have both ratings, so they are free to work on either engine or airframe components. See Title 14 Code of Federal Regulations (14 CFR) section 65.71 for more on A&P rating eligibility requirements.

Although mechanics can earn A&P certification through training and experience (including military) requirements (18 months for a single rating or 30 months of concurrent experience for both), the most popular option is to graduate from a certificated part 147 Aircraft Maintenance Technician School (AMTS). These schools, which are individually certificated as air agencies, are held to a strict set of standards outlined in their namesake — 14 CFR part 147 — that define everything from training materials and shop equipment to attendance and record-keeping. Some AMT schools, such as New York City's Aviation High School and others, provide access to internship programs that give students a chance to work in a real-world aviation maintenance environment.

The Options

Another option for the mechanically-minded is a repairman certificate. This certificate has less restrictive eligibility requirements but has a much more narrow scope of privileges. Certificated repairmen can only perform maintenance within the scope of their training and specific job duties and be authorized to work under the employment of the repair station (or air carrier) through which they received certification. This means that your repairman certificate is not portable to different employers. One new development for repairmen came with the light-sport aircraft rule, which established a light-sport repairman certificate with two ratings: inspection and maintenance. See 14 CFR part 65, subpart E for more information on repairman certificates.

Keeping the Blade Sharp

So, if you have the "aviation bug" and your idea of aviating is more in tune with using a multimeter and torque wrench than a headset and sectionals, perhaps aircraft maintenance training is for you. The industry will continue to grow and evolve, especially with the rapid introduction of new technologies. But one thing that will not change is a need for quality training and education, which you are sure to find at an AMT school near you. Remember that aircraft maintenance training can also be a springboard for other career options, such as IA (Inspection Authorization), director of maintenance (DOM), aerospace engineer, or chief inspector. The sky is the limit, so what are you waiting for?

Tom Hoffmann is the managing editor of *FAA Safety Briefing*. He is a commercial pilot and holds an A&P certificate.

UNDERSTANDING OWNER-PERFORMED PREVENTIVE MAINTENANCE

Pilots who perform preventive maintenance on their aircraft can learn a great deal about the inner workings of engines and airframes, as well as all their associated systems and components. But if this is your first foray into aviation maintenance, it's a good idea to review some of the basics of what's required before you get started.

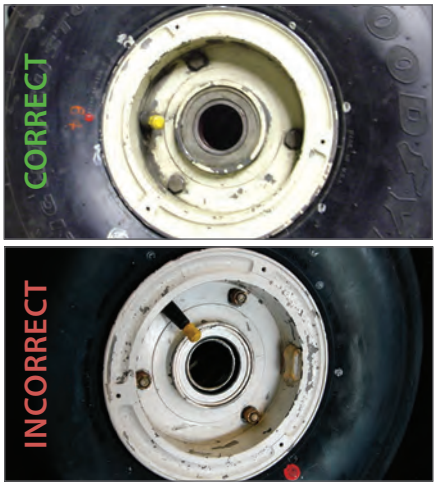
First, you'll need to know exactly what kind of maintenance you can legally perform on your aircraft. If you hold at least a private pilot certificate issued under Title 14 Code of Federal Regulations (14 CFR) part 61 and your aircraft is not used under 14 CFR parts 121, 129, or 135, you may perform preventive maintenance on your own aircraft. To see a list of the 31 items a pilot can perform without supervision, see Appendix A in 14 CFR part 43 (bit.ly/43AppA).

Examples include:

- Removal, installation, and repair of landing-gear tires
- Replacing or cleaning spark plugs and setting of spark plug gap clearance
- Replacing and servicing batteries

Before you start changing tires or batteries, be sure you understand an often overlooked detail that can affect your eligibility to perform these tasks. 14 CFR section 1.1 defines preventive maintenance as "... simple or minor preservation operations and the replacement of small standard parts not involving complex assembly operations." The keyword here is *complex*.

Due to differences in aircraft design and accessibility of certain components, a procedure like changing an oil filter may be a simple job on some aircraft but complex on others. Similarly, changing a tire might require you to perform the more difficult task of removing and reinstalling the brake assembly. Owners and pilots must use good judgment in determining whether a specific function appropriately qualifies as preventive maintenance. When in doubt, talk to a mechanic.



When changing a tire, remember the yellow dot (heaviest part of tube) should line up with red dot (lightest part of tire) for proper balance.

Be sure you also understand all facets of the work you plan to perform, along with careful attention to all applicable regulations. Pilots performing preventive maintenance are bound by the same regulations as any certificated aviation maintenance technician. This includes making certain you have all the available tools, equipment, and test apparatus necessary for any maintenance task and all associated reference materials and manuals. In particular, 14 CFR section 43.13(a) states that each person performing maintenance — pilot or mechanic — is required to use "the methods, techniques, and practices prescribed in the current manufacturer's maintenance manuals … or data acceptable to the Administrator."

Properly recording any work you perform on aircraft is another important element of preventive maintenance that should never be overlooked. This is something FAA Airworthiness Aviation Safety Inspector Gary Knaggs strives to emphasize during interactions with pilots. "A proper maintenance record entry should consist of three main parts: a description of the work, the date, and a signature along with a certificate number and type," says Knaggs.

Performing maintenance on your aircraft can have several important benefits. It can save time, money, and can open doors to a new level of understanding your aircraft. But along with this new knowledge comes responsibilities.

Beech *Bonanza* owner and aircraft mechanic Adrian Eichhorn advocates for pilots to get engaged with preventive maintenance on their airplanes but encourages them to take a "crawl, walk, run" approach. "Try doing some tasks under the supervision of a mechanic first," says Eichhorn, "and always keep the appropriate manual and references nearby." With good practices, the proper tools and materials, and a professional attitude, you'll be sure to "maintain" your way to greater safety.

Tom Hoffmann is the managing editor of *FAA Safety Briefing*. He is a commercial pilot and holds an A&P certificate.

LEARN MORE

Advisory Circular (AC) 43-12A, *Preventive Maintenance*
bit.ly/AC43-12

FAA Safety Briefing, Mar/Apr 2010, "Maintaining Your Way to Greater Safety"
bit.ly/2oLZoEy

PREFLIGHT AFTER MAINTENANCE

Not unlike many fixed-wing pilots, rotorcraft pilots are sometimes lulled into a false sense of security after getting their aircraft back from the maintenance shop. They might assume everything is in perfect or better-than-ever working order. While any mechanic worth his or her salt will always endeavor to do the best job possible, mistakes do happen. Sometimes big ones. The good thing is that with an added layer of knowledge, scrutiny, and attention during preflight, you'll be much better prepared for catching any red flags and increase your chances of a safe flight.

But how do you know where or what to focus on during a preflight inspection after maintenance? Let's have a look at some best practices that are bound to help take your post-maintenance preflight prowess to the next level.

- First, review the maintenance records, including any previous squawks, to see what was worked on and where you should focus your inspection. Then if possible, have the mechanic who performed the work walk around the aircraft with you. They might be able to point out things that you might miss.
- Use a preflight kit that includes all items you'll need to do a thorough check during your inspection. This should include a flashlight, inspection mirror, checklist, and any other tools you need to access the aircraft (work stands, ladders, etc.).
- Perform the preflight with the cowlings and inspection panels open or removed to view any inaccessible areas.
- Check for any foreign objects like debris or any left-behind tools or hardware.
- Speaking of hardware, check that all bolts and screw heads with holes are properly fastened (e.g., safety-wired).
- Challenge yourself to find something wrong or out of place. Assume something is wrong and be on a mission to find it.
- Use your checklist! But also recognize how vague some of the tasks can be. The word "check" can indicate several things so learn what it means specifically for the item you're inspecting.
- Be sure to inspect some specific items like filter bowl security, proper filter by-pass indicator extension, intact slippage marks, the condition of elastomeric or greaseable bearings on main/tail rotors, and hangar bearings and flex plate bevel washers.

You can learn more about the importance of preflight by checking out the Rotorcraft Collective video series here bit.ly/RotorPlaylist. There are two videos on preflight along with other topics like ground operations in icing conditions and preflighting your passengers.

This information is also part of a broader effort to focus on key safety issues for rotorcraft pilots, called Helicopter Safety Enhancements (HSEs), as determined by the U.S. Helicopter Safety Team (USHST). H-SE 28, *Helicopter Final Walk-Around/Security of External Cargo*, was specifically developed to provide best practices for helicopter preflight inspection, final walk-around, and postflight inspection (see Learn More link for more on H-SE 28). Read about all the HSEs here: ushst.org/h-se-details.

Tom Hoffmann is the managing editor of *FAA Safety Briefing*. He is a commercial pilot and holds an A&P certificate.

LEARN MORE

FlySafe Fact Sheet — Advanced Preflight After Maintenance
bit.ly/PreflightMx

12 Rules to Live by for Your Pre-Flight Helicopter Inspection, USHST
bit.ly/12HeliPreflightRules (PDF)

H-SE 28, Helicopter Final Walk-Around/Security of External Cargo
bit.ly/HSEwalkAround (PDF)

Check out our GA Safety Facebook page at **Facebook.com/groups/GASafety.**

If you're not a member, we encourage you to join the group of more than 15,000 participants in the GA community who share safety principles and best practices, participate in positive and safe engagement with the FAA Safety Team (FAASTeam), and post relevant GA content that makes the National Airspace System safer.

From Our Twitter Channels

Thanks, MayCay!

Drones provide many opportunities to work in aerospace, and you don't even need to leave the ground. Read about drone jobs at bit.ly/3EWVNW2.

Do you know that you can use tools to help you forecast problems before they reach the point of failure? Learn about flight data monitoring and more at bit.ly/31AgZmn.

Be All You Can Be

Want to be the best aviation maintenance technician you can be? Take advantage of free and low-cost training in the article "Safety is a Journey" at bit.ly/3m73u4D.

All Shapes and Sizes

More than 2,500 people volunteered last year as FAA Safety Team Representatives! They help the FAA spread its safety message to pilots, mechanics, and drone operators. Read about their essential volunteer work (bit.ly/3m3Eziw).

The great thing about being a FAASTeam Volunteer is the amazing group of people you get to meet at the seminars — incredible knowledge shared.
— Kent

Oldies But Goodies

Susan — I enjoyed reading your article, "No Place Like Drome" (bit.ly/NoPlaceLikeDrome), visiting the airport was always rewarding. After 50 years in aviation, I still love it. Please don't forget "*The High and the Mighty*" and "*Fate is the Hunter.*" They may be old but very enjoyable for those who love aviation.
— Glenn

Hi Glenn — Thanks for the note; "No Place Like 'Drome" was fun to write, and I'm glad you enjoyed it. As for books and movies — yes, absolutely the older ones are great too. Take a look at our Nov/Dec 2021 issue on STEM and STEAM (which includes the arts); my "Postflight" column for this one includes a list of aviation books/movies/podcasts, and those are on the list (bit.ly/SteamRises). Aviation really does have something for everyone, doesn't it?

For more stories and news, check out our new blog "Cleared for Takeoff" at medium.com/FAA.

Let us hear from you! Send your comments, suggestions, and questions to SafetyBriefing@faa.gov. You can also reach us on Twitter @FAASafetyBrief or on Facebook at facebook.com/FAA.

We may edit letters for style and/or length. Due to our publishing schedule, responses may not appear for several issues. While we do not print anonymous letters, we will withhold names or send personal replies upon request. If you have a concern with an immediate FAA operational issue, contact your local Flight Standards Office or air traffic facility.

SUSAN K. PARSON

TIMING IS EVERYTHING

Life events impeded my longstanding habit of reading. But I am trying to get back in the groove with a tome on time: specifically, David Rooney's "About Time: A History of Civilization in Twelve Clocks." I can confirm that Rooney's book lives up to its marketing as "a captivating, surprising history of timekeeping and how it has shaped our world."

Like most aviation aficionados, I can channel just about any subject into something related to flying. So too with a book on time. There are plenty of examples of how the measurement of time organizes, regulates, and even tyrannizes our lives. We probably don't even notice most of them.

If, however, you are an aircraft owner, operator, or maintainer, timing really is everything when it comes to safe (and legal) operations. We have explored some of these topics in this issue of *FAA Safety Briefing* magazine, but let me close with just a few of the timing topics of special importance.

Aging Aircraft

New aircraft are everywhere, but a substantial portion of the legacy general aviation (GA) fleet continues to age. That leads to obvious questions about whether a geriatric airplane can safely continue to operate. Aging can also affect more modern construction materials and methods. Key questions include: Where has the aircraft been geographically? Has it been hangared? Was it flown in any special or severe usage capacity?

Working with industry, the FAA has devoted considerable time and resources to evaluating age-related issues, as well as key factors for mitigating the effects of aging in GA aircraft. Check out the resources listed in the Learn More section. In addition, an FAA-sponsored website (aginggeneralaviation.org) provides access to type-specific aging aircraft maintenance information.

Required Maintenance and Inspections

	What	How Often	Reference
A	Annual inspection (includes a check of Airworthiness Directives)	Every 12 calendar months	14 CFR 91.409
V	VOR check (if used for IFR)	Every 30 days	14 CFR 91.171
1	100 hour inspection (if used to carry passengers for hire or flight instruction in an aircraft that person provides)	Every 100 hours	14 CFR 91.409
A	Altimeter & Static System test and inspection (for airplane or helicopter operated under IFR in controlled airspace)	Every 24 calendar months	14 CFR 91.411
T	Transponder test and inspection	Every 24 calendar months	14 CFR 91.413
E	ELT (emergency locator transmitter) inspection & battery currency (with some exceptions)	Every 12 calendar months (see ref. for battery replacement schedule)	14 CFR 91.207

Maintenance and Inspections

Whether you own, rent, or participate in a joint ownership arrangement, you are obligated to verify that the aircraft you are about to fly is legally airworthy (it conforms to its type design and is safe to fly). Since most of these events are driven by cumulative operations or calendar dates, awareness of the appropriate timing is also important when it comes to aircraft maintenance and inspection requirements.

An oil change is a good example of maintenance required (or at least recommended) on the basis of cumulative operations. Except for new engine break-in periods, which carry their own manufacturer-recommended intervals, my former flying club generally planned oil changes for every 50 hours of flying time.

Inspections tend to be required by regulation and thus tied more closely to the calendar than to operating intervals. The Required Maintenance and Inspections chart uses the "AV1ATE" acronym to summarize the more common calendar-driven inspection intervals.

Bear in mind, though, that inspection methods and techniques may change or require "special attention" inspections as an airplane ages.

Susan K. Parson (susan.parson@faa.gov) is editor of *FAA Safety Briefing*. She is a general aviation pilot and flight instructor.

LEARN MORE

Advisory Circular (AC) 20-106, *Aircraft Inspection for the GA Aircraft Owner*
bit.ly/AC20-106

Best Practices Guide for Maintaining Aging General Aviation Airplanes
bit.ly/AgingBPguide

FAA-H-8083-19A — Plane Sense Handbook for General Aviation
bit.ly/PlaneSense

GARY KNAGGS

Aviation Safety Inspector for Airworthiness, National FAA Safety Team

Being from a small farming town in the middle of Michigan, Gary Knaggs had never thought about aviation as a career until a family friend mentioned it. He was introduced to an aviation maintenance technology program at his local community college as a junior in high school. He applied and hasn't looked back since. According to Gary, working on airplanes is much more fun than working on tractors caked in cow pies.

After completing the college maintenance program, Gary took on jobs that included aircraft mechanic, chief inspector, and director of maintenance for various aviation companies. Then in 1998, he was hired as an airworthiness aviation safety inspector (ASI) in the Flight Standards District Office (FSDO) in Detroit.

In 2006, Gary became one of two FAA Safety Team (FAASTeam) program managers at the FSDO. His focus: outreach to the local general aviation community about aircraft airworthiness safety issues. Now he is part of the National FAASTeam at FAA headquarters.

The purpose of the FAASTeam is to lower the nation's aviation accident rate by conveying safety principles and practices through training, outreach, and education while establishing partnerships and encouraging the continual growth of a positive safety culture within the aviation community.

In his new role, Gary helps with managing courses available on FAASafety.gov. He teaches and is the course mentor for prerequisite training of new FAASTeam program managers around the country. He is also the course mentor for initial and recurring courses taught at the FAA Training Center in Oklahoma City and remotely-sited courses.

"One of my favorite assignments is co-leading the FAA Safety Center seminars held during AirVenture in Oshkosh, Wisconsin," states Gary. "I am also the audio-visual lead up in the booth. Each year, we organize the speakers to present during the fly-in, create the schedule, and assist with whatever is needed to make the presentations successful."

The COVID-19 public health emergency prevented those seminars from happening last year. It has caused the FAASTeam everywhere to make adjustments in developing safety material and discover new ways to use available technology to present topics.

"The transition from in-person seminars to Zoom meetings has been a challenge," explains Gary. "But, our FPMs [FAASTeam Program Managers] have done a great job adapting to the current situation."

Gary asks all aviation maintenance technicians to stay the course.

"Keep doing your best to ensure your work is the best it can be," he continues. "Our goal, as maintainers, is to do everything we can to make sure the aircraft is mechanically safe so that pilots and passengers can enjoy a fine running and reliable aircraft."

If you happen to make it to AirVenture this summer or next, make sure to stop by the FAA Safety Center for some sound safety education and to wave to Gary, the wizard behind the curtain.

Paul Cianciolo is an associate editor and the social media lead for *FAA Safety Briefing*. He is a U.S. Air Force veteran and an auxiliary airman with Civil Air Patrol.

From Left to Right: Retired FPM Eddie Shields, FAASTeam Manager Patricia Mathes, FPM Larry Cheek, and Gary.

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Look Who's Reading FAA Safety Briefing

To keep the world's largest fleet of single-engine piston aircraft prepared to respond at a moment's notice, Civil Air Patrol's National Commander Maj. Gen. Edward D. Phelka reads *FAA Safety Briefing* for up-to-date safety knowledge.

faa.gov/news/safety_briefing

@FAASafetyBrief